Notice No. 10

Rules and Regulations for the Classification of Ships, July 2013

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Issue date: July 2014

Amendments to	Effective date
Part 5, Chapter 2, Section 12	1 July 2014
Part 5, Chapter 5, Section 3	1 July 2014
Part 5, Chapter 7, Section 3	1 July 2014
Part 5, Chapter 8, Section 2	1 July 2014
Part 5, Chapter 12, Sections 1 & 2	1 July 2014
Part 5, Chapter 14, Sections 8 & 12	1 July 2014
Part 5, Chapter 15, Section 7	1 July 2014
Part 5, Chapter 24, Section 9	1 July 2014
Part 6, Chapter 1, Sections 1, 2, 3 & 6	1 July 2014
Part 6, Chapter 2, Sections 1, 5, 6, 7, 9, 10, 11, 12, 14, 16, 18, 19 & 20	1 July 2014
Part 7, Chapter 9, Section 3	1 July 2014
Part 7, Chapter 11, Sections 1, 2, 3 & 4	1 July 2014
Part 7, Chapter 12 (whole Chapter)	1 July 2014
Part 7, Chapter 13, Sections 1, 2, 3, 4, 5 & 7	1 July 2014
Part 7, Chapter 14, Sections 2 & 3	1 July 2014

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Part 5, Chapter 2

Oil Engines

Effective Date 1 July 2014

■ *Section 12*

Component tests

12.3 Auto frettage

~~*12.3.1* The following documents and information are to be submitted in support of components subject to autofrettage:~~

~~(a) Drawings and other related documents/information, including material grade, dimensions and autofrettage pressure.~~

~~(b) Calculations and tests undertaken to define pressures, times and other parameters relevant for the autofrettage process.~~

~~(c) Calculations and tests verifying increased fatigue endurance of components treated by autofrettage.~~

~~(d) Place of manufacture and sub-suppliers.~~

~~(e) Description of manufacturing QA process including control of suppliers.~~

~~(f) Description detailing how repeatability and reliability of autofrettage process is achieved.~~

~~(g) Methods and documents for recording results.~~

~~(h) Finished component and/or system testing.~~

12.3.1 Manufacturers who carry out auto-frettage to enhance the fatigue life of components are to be approved by LR.

Part 5, Chapter 5

Gearing

Effective Date 1 July 2014

■ *Section 3*

Design

3.7 Design of enclosed gear shafting

3.7.1 This sub-Section is applicable to solid shafting enclosed within the gearcase~~. Final~~ of single input/single output gearing. Alternative configurations and hollow shaft designs, final gear wheel shafts and thrust shafts are to be in accordance with Ch 6,3.3 and Ch 6,3.4 respectively.

Part 5, Chapter 7
Propellers

Effective Date 1 July 2014

■ *Section 3*
Design

3.2 Keyless propellers

(*Part only shown*)

3.2.5 For the triple element keyless propeller, the yield stress or 0,2 per cent proof stress of the propeller material, σ_o is to be not less than:

$$\cancel{\sigma_o = 1{,}4 p_3 \sqrt[4]{\frac{3k_2^4 + 1}{k_2^2 - 1}} \text{ N/mm}^2 \text{ (kgf/mm}^2\text{)}}$$

$$\sigma_o = 1{,}4 p_3 \frac{\sqrt[4]{3k_2^4 + 1}}{k_2^2 - 1} \text{ N/mm}^2 \text{ (kgf/mm}^2\text{)}$$

Part 5, Chapter 8
Shaft Vibration and Alignment

Effective Date 1 July 2014

■ *Section 2*
Torsional vibration

2.1 General

2.1.2 Further to the Scope of this Chapter, the requirements of this Section are ~~not~~ applicable~~ to ships that are not~~:

(a) to ships that are required to comply with the *International Convention for the Safety of Life at Sea,1974*, as amended, (SOLAS); ~~or~~ and

(b) for all other ships where any one main engine ~~does not have~~ has a power output exceeding 500 kW.

Part 5, Chapter 12
Piping Design Requirements

Effective Date 1 July 2014

■ *Section 1*
General

1.6 Materials

1.6.2 ~~The manufacturer's certificate for materials for pipes, valves and fittings of Class I and Class II piping systems will be accepted in lieu of LR's materials certificate where the maximum conditions are less than either of the values shown in Table 12.1.2. *See* Ch 1,3.1.3(c) of the Rules for Materials.~~ The Manufacturer's materials certificate will be accepted in lieu of an LR materials certificate for Class III piping systems and for all other classes of piping and associated components where the maximum design conditions are less than the values shown in Table 12.1.2. *See* Ch 1,3.1.3(c) of the Rules for Materials.

Table 12.1.2 Maximum conditions for pipes, valves and fittings for which manufacturer's materials test certificate is acceptable

Material	~~Working temperature °C~~	*DN* = nominal diameter, mm p_W = working pressure, bar
~~Carbon and low alloy steel~~ ~~Austenitic stainless steel~~ ~~Spheroidal or nodular cast iron~~ When the working temperature is less than 300°C: Carbon and low alloy steel, austenitic stainless steel and cast iron (spheroidal or nodular)	~~< 300~~	$DN < 50$ or $p_W \times DN < 2500$
Copper alloy intended for a working temperaure of less than 200°C	~~< 200~~	$DN < 50$ or $p_W \times DN < 1500$

■ *Section 2*
Carbon and low alloy steels

2.8 Socket weld joints

2.8.1 Socket weld joints may be used in Class III systems with carbon steel pipes of any outside diameter. Socket weld fittings are to be of forged steel and the material is to be compatible with the associated piping. In particular cases, socket welded joints may be permitted for piping systems of Class I and II having outside diameter not exceeding 88,9 mm. Such joints are not to be used where fatigue, severe erosion or crevice corrosion is expected to occur or where toxic or asphyxiating media are conveyed~~.~~, other than for carbon dioxide fire-extinguishing distribution piping, ~~See~~ *see also* Ch 10,14.4.9.

2.8.4 Socket weld joints may be used in carbon dioxide fire-extinguishing system distribution piping only as permitted by 2.14.

2.9 Welded sleeve joints

2.9.1 Welded sleeve joints may be used in Class III systems with carbon steel pipes of any outside diameter. In particular cases, welded sleeve joints may be permitted for piping systems of Class I and II having outside diameter not exceeding 88,9 mm. Such joints are not to be used where fatigue, severe erosion or crevice corrosion is expected to occur or where toxic or asphyxiating media, other than for carbon dioxide fire-extinguishing distribution piping, are conveyed.

2.9.4 Welded sleeve joints may be used in carbon dioxide fire-extinguishing system distribution piping only as permitted by 2.14.

Existing paragraphs 2.9.4 *to* 2.9.7 *have been renumbered* 2.9.5 *to* 2.9.8.

2.14 Carbon dioxide (CO_2) fire-extinguishing system piping

2.14.1 The piping for carbon dioxide fire-extinguishing systems is to comply with the requirements of Chapter 5 of the FSS Code, as applicable. For purposes of Classification, any use of the word 'Administration' in the Regulation is to be taken to mean LR.

2.14.2 Materials for the distribution manifolds between the carbon dioxide storage bottles and the discharge valves to each section and associated pipes, valves and fittings of high pressure systems are to be manufactured and tested in accordance with the requirements for Class I piping systems. Pipes are to meet the minimum wall thickness requirements of Table 12.2.9 and the manifold system is to be hydraulically tested to a pressure of 190 bar. A high pressure system is defined as a system where the carbon dioxide is stored at ambient temperature.
Materials for the distribution manifolds between the carbon dioxide storage vessel(s) and the discharge valves to each section and associated pipes, valves and fittings of low pressure systems are to be manufactured and tested in accordance with the requirements for Class II piping systems and the manifold system is to be hydraulically tested to a pressure of 33 bar. A low pressure system is defined as a system where the carbon dioxide is stored at a working pressure in the range of 1,8 N/mm^2 to 2,2 N/mm^2.

2.14.3 Piping downstream of the distribution valve(s) for high pressure systems is to be manufactured and tested in accordance with the requirements for Class II piping and is to meet the minimum wall thickness requirements of Table 12.2.4. After installation the distribution system is to be leak tested at a pressure of 6 bar.
Piping downstream of the distribution valve(s) for low pressure systems is to be manufactured and tested in accordance with the requirements for Class III piping. After installation the distribution system is to be leak tested at a pressure of 6 bar.
Class III piping may be used for open ended distribution piping downstream of the distribution valve(s) of high pressure systems where agreed by LR and where meeting the minimum wall thickness requirements of Table 12.2.4 and where a minimum of ten per cent of the piping is hydraulically tested at a pressure of 125 bar. This testing is to be carried out before installation.

2.14.4 Any part of the carbon dioxide fire-extinguishing system piping is to be of galvanised steel or of corrosion-resistant steel. Where full penetration butt welding is used, the pipe is to be protected against corrosion in the area of the weld seam after welding. The process for protecting the pipe internally against corrosion is to be of an approved type.
All pipes are to be arranged to be self-draining. Where pipes are to be led into refrigerated spaces, this is subject to special consideration. The ends of distribution pipes downstream of the distribution valve(s) are to extend at least 50 mm beyond the last nozzle and are to be fitted with a dirt trap consisting of an open ended tee with a capped nipple.

2.14.5 If it is necessary for carbon dioxide pipes to pass through accommodation spaces, the pipe is to be seamless and is to meet the requirements for Class II pipes. Joints are to be made only by welding and the pipes are to be hydraulically tested after installation at a pressure of 50 bar.

2.14.6 The following means are permitted for making joints on carbon dioxide fire-extinguishing system piping;
(a) Full penetration butt welding, where the pipe is galvanised, *see* 2.14.4.
(b) Couplings as permitted by Table 12.2.7.
(c) Cone connections.
(d) Tapered screw joints, where allowed by 2.14.10 and where meeting the requirements of 2.14.10.
(e) Flanged joints.
(f) Socket weld joints to acceptable National Standards and where allowed by 2.14.7 and where meeting the requirements of 2.14.9.
(g) Welded sleeve joints may be used where allowed by 2.14.8 and where meeting the requirements of 2.14.9.

2.14.7 Socket weld joints of an approved type may be used downstream of the distribution valve(s), provided that the requirements for materials and limitations on outside diameter applicable for Class II piping are applied.

2.14.8 Welded sleeve joints of an approved type may be used within the protected space, provided that the requirements for materials and limitations on outside diameter applicable for Class II piping are applied.

2.14.9 Where socket weld joints or welded sleeve joints are utilised, the pipes in way of the welded joints are to be adequately supported and the joints are to be located where they are visible. Where welding is to be carried out *in situ*, the piping is to be kept clear of adjacent structures to allow sufficient access for preheating and welding, which is to be carried out in accordance with approved procedures.

2.14.10 Threaded joints are only allowed inside the protected spaces and in carbon dioxide bottles storage rooms. They should have no exposed screw threads and any sealing medium should be selected as to ensure no protrusions or debris might be produced in the pipe.

(*Part only shown*)
Table 12.2.8 Application of mechanical joints depending on class of piping

Types of joints	Classes of piping systems		
	Class I	Class II	Class III
Compression couplings			
Swage type	~~–~~ +	~~–~~ +	+
Bite type	+(OD ≤ 60,3 mm)	+(OD ≤ 60,3 mm)	+
Flared type	+(OD ≤ 60,3 mm)	+(OD ≤ 60,3 mm)	+
Press type	–	–	+

Part 5, Chapter 14

Machinery Piping Systems

Effective Date 1 July 2014

■ *Section 8* Lubricating oil systems

8.7 Filters

8.7.3 Centrifuges used for lubricating oil treatment are to be type tested for a ship in accordance with a national or international standard acceptable to LR.

■ *Section 12* Control, ~~supervision and monitoring~~ alarm and safety systems of machinery

~~12.3 Inert gas generators~~

~~*12.3.1* Alarms and safeguards are indicated in 12.3.2 and Table 14.12.2.~~

~~Table 14.12.2 Inert gas generators: Alarms and safeguards~~

Item	Alarm	Note
Inert gas outlet temperature	High	Oil fuel burners to be shut off automatically
Combustion air pressure	Low	Oil fuel burners to be shut off automatically
Oil fuel pressure	Low	—
Oil fuel temperature or viscosity	High and low	Heavy oil only
Burner flame and ignition	Failure	Oil fuel to burner to be shut off automatically, *see* Note 1
Cooling water pressure or flow	Low	Oil fuel to burner to be shut off automatically
Cooling water temperature	High	—
Combustion space cooling water level (where continuous circulation is required)	High	Cooling water pump and oil fuel to burner are to be shut off automatically
Oil fuel supply	Insufficient	
Power supply to inert gas generator	Failure	Gas regulating valve is to be shut down automatically
Automatic control system power supply	Failure	

NOTES
1. Combustion spaces are to be purged automatically before re-ignition takes place in the event of a flame-out on all burners.
2. *See also* Chapter 15.

~~*12.3.2* Inert gas generators are to be fitted with an automatic combustion control system in order to maintain steady state conditions throughout the operating range of the generator.~~

~~*12.3.3* For the requirements of flue gas inert gas systems, see Ch 15,7.~~

Existing sub-Sections 12.4 *and* 12.5 *have been renumbered* 12.3 *and* 12.4.

Existing Tables 14.12.3 *and* 14.12.4 *have been renumbered* 14.12.2 *and* 14.12.3.

Part 5, Chapter 15

Piping Systems for Oil Tankers

Effective Date 1 July 2014

■ *Section 7*
Inert gas systems

7.7 Unattended machinery

7.7.1 Where inert gas generators are fitted with automatic or remote controls so that under normal operating conditions they do not require any manual intervention by the operators, they are to be provided with the alarms and safety arrangements required by 7.7.2, 7.7.3, 7.8 and 7.10, as appropriate. Alternative arrangements which provide equivalent safeguards will be considered.

7.7.2 Where machinery is arranged to start automatically or from a remote control station, interlocks are to be provided to prevent start-up under conditions which could hazard the machinery.

7.7.3 Where machinery specified in 7.7.1 and 7.7.2 is required to be provided with a standby pump, the standby pump is to start automatically if the discharge pressure from the working pumps falls below a predetermined value.

~~7.7~~ 7.8 Instrumentation and alarms

7.8.1 Alarms and safeguards are indicated in 7.8.2 to 7.8.17 and Table 15.7.1.

7.8.2 Inert gas generators are to be fitted with an automatic combustion control system so as to maintain steady state conditions throughout the operating range of the generator.

Existing paragraphs 7.7.1 *to* 7.7.7 *have been renumbered* 7.8.3 *to* 7.8.9.

~~*7.7.8*~~ *7.8.10* For inert gas systems of the inert gas generator type, additional audible and visual alarms are to be provided to indicate:

(a) insufficient oil fuel supply,
(b) failure of the power supply to the generator,
(c) failure of the power supply to the automatic control system for the generator.

See also Pt 6, Ch 1 for requirements for control, alarm and safety systems~~, and additional requirements for unattended operation~~.

Existing paragraphs 7.7.9 *to* 7.7.15 *have been renumbered* 7.8.11 *to* 7.8.17.

Table 15.7.1 Inert gas systems – Alarms and safeguards

Item	Alarm	Note
Water pressure or water flow to flue gas scrubber	Low	1, 2, 3
Water level in flue gas scrubber	High	1, 2, 3
Inert gas temperature from inert gas blowers	High	1, 2, 3
Inert gas blower operation	Failure	4
Oxygen content of gas in excess of 5%	High	5, 6
Power supply to automatic control system for inert gas regulating valve and indicating devices	Failure	5
Water level in inert gas system water seal	Low	7
Inert gas pressure discharge from inert gas blowers less than 100 mm water gauge	Low	5, 8
Inert gas pressure	High	8
Combustion air pressure to oil burner	Low	3
Oil fuel pressure	Low	—
Oil fuel temperature or viscosity	High and Low	9
Burner flame and ignition	Failure	3
Cooling water temperature	High	—
Oil fuel supply	Insufficient	—
Power supply to inert gas generator	Failure	4
Automatic control system power supply	Failure	—

NOTES
1. Combustion spaces are to be purged automatically before re-ignition takes place in the event of a flame out on all burners.
2. Inert gas blowers to be shut down automatically and inert gas regulating valve is to be closed automatically.
3. Oil fuel to burner to be shut off automatically.
4. Inert gas regulating valve to be closed automatically.
5. To be fitted in the machinery space and cargo control room, where provided, *see* 7.8.14.
6. Operator is required to submit operational procedures for the suspension of cargo operations until inert gas quality is improved for review, *see* 7.8.17.
7. For dry and semi-dry water seals, *see* 7.8.15.
8. *See* 7.8.4(a).
9. Heavy oil only.
10. The Table contains the minimum list of alerts and shutdowns for an inert gas generator; additional alerts and shutdowns may be necessary as determined through risk-mitigating activities in response to the completed Risk-Based Analysis (e.g., FMECA) for the inert gas generator.

Existing sub-Section 7.8 *has been renumbered* 7.9.

~~7.9~~ 7.10 Nitrogen generator systems

7.10.2 Alarms and safeguards are indicated in 7.10.3 to 7.10.19 and Table 15.7.2.

Table 15.7.2 Nitrogen generator systems – Alarms and safeguards

Item	Alarm	Note
Feed air pressure from air compressor	Low	1, 4
Air compressor discharge temperature	High	1, 4
Water level in condensate drain separator	High	1, 4
Electric heater (where fitted)	Failure	1, 4
Oxygen content	High	1, 2, 4
Power supply to oxygen content monitoring instrumentation downstream of Nitrogen generator	Failure	1, 3

NOTES
1. To be fitted in the machinery space and cargo control room, where provided, *see* 7.8.14.
2. Oxygen content not to exceed 5% with automatic discharge to atmosphere where this is exceeded, *see* 7.10.7.
3. *See* 7.10.15.
4. Automatic shutdown of inert gas generating system.
5. The Table contains the minimum list of alerts and shutdowns for an inert gas generator; additional alerts and shutdowns may be necessary as determined through risk-mitigating activities in response to the completed Risk-Based Analysis (e.g., FMECA) for the inert gas generator.

Existing paragraphs 7.9.2 *to* 7.9.18 *have been renumbered* 7.10.3 *to* 7.10.19.

Existing sub-Section 7.10 *has been renumbered* 7.11.

Part 5, Chapter 24

Emissions Abatement Plant for Combustion Machinery

Effective Date 1 July 2014

■ *Section 9*
Electrical and control equipment

9.1 General

9.1.7 The emergency stop function is to be capable of being actuated from the machinery control room, the navigating bridge and from within compartments containing ~~chemical tanks and~~ exhaust gas cleaning plant.

In order to mitigate the risk of chemical release, spaces containing chemical storage tanks or chemical pumping equipment are to have an emergency stop which is to shut down the chemical supply to the emissions abatement plant. Other parts of the emissions abatement plant such as wash water pumps need only be stopped by this emergency stop where loss of chemical injection could result in further risks arising from operating the plant without chemical injection. This is to form part of the submission required in 3.1.6.

Table 9.1.9 Machinery emissions to air abatement plant: alarms and safeguards

Item	Alarm	Note
Exhaust gas outlet temperature	High	
Exhaust gas inlet temperature	High	
Exhaust gas inlet temperature	Low	Only for selective catalytic reduction
Differential pressure across abatement plant unit	High	
Abatement plant by-pass valve in exhaust duct	Valve movement	*See* Note 1
Machinery exhaust duct isolating valve	Valve movement	*See* Note 2
Wet emissions abatement unit overboard discharge valve	Closed	Emissions abatement plant is to be shut down automatically, *see* Note 6
Wet emissions abatement unit overflow line flow detection	Flow present	Emissions abatement plant is to be shut down automatically, *see* Note 6
Wet emissions abatement water pressure	Low	
~~Wet emissions abatement unit water temperature~~	~~High~~	
~~Chemical feed flow~~	~~High~~	
Wet emissions abatement unit water level	1st Stage high	
Wet emissions abatement unit water level	2nd Stage high	Emissions abatement plant is to be shut down automatically, *see* Note 6
Chemical feed flow	High	Chemical feed pump is to be shut down automatically
Chemical feed flow	1st Stage low	
Chemical feed flow	2nd Stage low	Chemical feed pump is to be shut down automatically
Process tank level	1st Stage high	*See* Note 3
Process tank level	2nd Stage high	Emissions abatement plant is to be shut down automatically, *see* Note 3
Chemical storage tank level	1st Stage high	
Chemical storage tank level	2nd Stage high	
Chemical storage tank level	Low	
Chemical storage tank temperature	High	*See* Note 4
Chemical storage tank temperature	Low	*See* Note 4
Chemical tank containment bund level	High	Tank outlet quick closing valve is to close automatically, *see* Note 5
Chemical tank containment drain line flow detection	Flow present	Tank outlet quick closing valve is to close automatically, *see* Note 5
Exhaust gas recirculating fan failure	Failure	
Recirculating exhaust gas temperature return to engine	High	
Induced draught fan failure	Failure	Where fitted

NOTES
1. Only where a by-pass valve is fitted, *see* 3.3.5. This valve shall open to the by-pass position as part of the unit shut-down logic.
2. Only where fitted, *see* 5.1.
3. The process tank is any tank forming part of a wet abatement system flow loop or effluent tanks which receive bleed-off from the main flow loop, or such tanks not forming part of the system flow loop but which are essential for operation of the system, including those on exhaust gas recirculating installations, *see* 7.1.9. Where low level can present a hazard, process tanks are also to have low level protection.
4. Where chemical substances are to be kept within a defined temperature range, alarms will be fitted, based on the allowable temperature range, *see* 5.1.2 and 7.1.10.
5. Chemical spillage detection alarm will depend on the means of spill containment fitted, *see* 5.1.2.
6. Wet emissions abatement unit shall include such systems fitted as part of the exhaust gas recirculating installations.

Part 6, Chapter 1
Control Engineering Systems

Effective Date 1 July 2014

■ *Section 1*
General requirements

1.1 General

~~*1.1.2* Whilst these requirements satisfy the regulations of the *International Convention for the Safety of Life at Sea*, 1974, and applicable amendments, attention should also be given to any relevant statutory requirements of the National Administration of the country in which the ship is to be registered.~~

~~*1.1.3* Section 2 of this Chapter states requirements for alarm systems, safety systems and automatic or remote controls where fitted.~~

~~*1.1.4* Section 3 of this Chapter states the essential alarms and safeguards which are required for unattended machinery as defined in 1.2.3, which under normal operating conditions is remotely controlled or is automatic in operation.~~

~~*1.1.5* Section 4 of this Chapter states requirements which shall apply where it is intended to operate the ship with machinery spaces unattended. In general, ships complying with the requirements of Section 4 will be eligible for the class notation **UMS**, *see* Pt 1, Ch 2,2.~~

~~*1.1.6* Section 5 of this Chapter states requirements which shall apply where it is intended to operate the ship with machinery spaces under continuous supervision from a centralised control station. In general, ships complying with the requirements of Section 5 will be eligible for the class notation **CCS**, *see* Pt 1, Ch 2,2.~~

~~*1.1.7* Section 6 of this Chapter states requirements which shall apply where it is intended that the control and supervision of ship operational functions are computer based. In general ships complying with the requirements of Section 6 will be eligible for the class notation **ICC**, *see* Pt 1, Ch 2,2.~~

1.1.2 Control engineering systems are to:

- provide control of required services and habitability requirements during defined operational conditions. This is to include, but is not limited to, power generation, propulsion and their associated services;
- provide control of the engineering systems necessary to ensure availability of essential and emergency safety systems during all normal and reasonably foreseeable abnormal conditions;
- provide control of the engineering systems necessary to ensure transitional power supplies remain available;
- be suitably protected against damage to itself under fault conditions and to prevent injury to personnel; and
- not fail in a way which may cause machinery and systems located in hazardous areas to create additional fire or explosion risk.

Existing paragraphs 1.1.8 *and* 1.1.9 *have been renumbered* 1.1.3 *and* 1.1.4.

1.2 ~~Plans~~ Documentation required for design review

1.2.1 ~~Plans required by~~ The documentation described in 1.2.2 to ~~1.2.8~~ 1.2.9 ~~are~~ is to be submitted ~~in triplicate~~ for design review.

(*Part only shown*)
1.2.2 Where control, alarm and safety systems are intended for the machinery or equipment as defined in 1.2.3 the following are to be submitted:

- List of safety functions and details of any overrides, including consequences of use, *see* ~~2.4.9~~ 2.4.8 and 2.6.9.

1.2.4 **System operational concept**. A description of the intended operation of the control, alarm and safety systems for the main and auxiliary machinery, and other systems essential for the propulsion and safety of the ship. This description is to include a demonstration that the design provides an effective means of operation and control for all ship operating conditions.

~~*1.2.5*~~ *1.2.6* **Programmable electronic systems**. In addition to the documentation required by 1.2.2 the following is to be submitted:

(a) System requirements specification.
(b) System functional description.
(~~b~~c) System integration plan, *see* 2.14.2.
(~~c~~d) Failure Mode and Effects Analysis (FMEA), *see* 2.14.5.
(~~d~~e) Details of the hardware configuration in the form of a system block diagram, including input/output schedules.
(~~e~~f) Hardware certification details, *see* 2.10.5 and 2.13.3.
(~~f~~g) Software ~~quality~~ production plans, including applicable procedures, *see* ~~2.10.20~~ 2.15.4.
(~~g~~h) Factory acceptance, integration and sea trial test schedules for hardware and software.
(~~h~~j) Details of data storage arrangements, *see* 2.10.10 and 2.13.6.

~~*1.2.7*~~ *1.2.8* Plans showing the location and details of control stations, e.g., control panels and consoles~~, location~~. Location and details of controls and displays on each panel. ~~Details of~~ Detailed user interface specifications. A general arrangement plan of control rooms showing the position of consoles, handrails, operator area, lighting, door and window arrangements. Drawing of HVAC systems including vent arrangements.

~~*1.2.9* **Cables**. For details of instrumentation and control system cabling requirements, *see* Ch 2,11.~~

Existing paragraphs 1.2.4 *to* 1.2.8 *have been renumbered* 1.2.5 *to* 1.2.9.

1.3 Control, alarm and safety equipment

1.3.1 ~~Major units of e~~Equipment associated with control, alarm and safety systems as defined in 1.2.3 are to be surveyed at the manufacturers' works in accordance with the approved test schedule *see* 1.2.2, and the inspection and testing are to be to the Surveyor's satisfaction.

1.3.4 Assessment of performance parameters, such as accuracy, repeatability, etc., are to be in accordance with an acceptable National or International Standard, e.g., IEC 60051~~,~~ ~~Direct acting indicating analogue electrical measuring instruments and their accessories~~: *Direct acting indicating analogue electrical measuring instruments and their accessories* (all parts).

1.3.5 Special consideration will be given to arrangements that comply with a relevant and acceptable ~~n~~National or ~~i~~International ~~s~~Standard, such as IEC 60092-504~~,~~: ~~*Electrical Installation on Ships – Special Features: Control and Instrumentation*~~ *Electrical installations in ships – Part 504: Special features – Control and instrumentation*.

1.4 Alterations and additions

1.4.2 Details of proposed software modifications are to be submitted for consideration. ~~Where the modification may affect compliance with these Rules, proposals for verification and validation are also to be submitted.~~ Modifications are to be undertaken in accordance with defined modification processes which are part of the supplier's or system integrator's quality management system. The following documentation is to be submitted:

(a) Project-specific software modification plan.
(b) An impact analysis which identifies the effect(s) of the proposed modification. The results of the analysis are to be used to inform the extent of verification and validation that is to be applied. This analysis is to consider both the local impact and, where applicable, the system level impact of the modification.
(c) Configuration management records that satisfy the requirements of ISO 10007, to demonstrate the traceability of the proposed modification.
(d) Factory acceptance, integration and sea trial test schedules as determined by the impact analysis in (b).
(e) Updated documentation as detailed in 1.2.5.

1.4.3 Verification and validation activities are to demonstrate that the modified functionality performs as expected and that the modification has not unintentionally modified functionality outside the scope of the modification.

Existing paragraph 1.4.3 *has been renumbered* 1.4.4.

1.5 Definitions

1.5.4 Alarm System: a system which will alert relevant personnel to faults, abnormal situations and other conditions requiring attention in the machinery and the safety and control systems.

1.5.5 Control System: a system which responds to input signals from the process and/or operator and generates output signals causing the equipment under control to operate in the desired manner.

1.5.6 Failure: a loss of the ability of a structure, system or element to function within acceptance criteria.

1.5.7 Fail safe: a system design such that, when a failure occurs, the system reverts to the least hazardous state.

1.5.8 A reasonably foreseeable abnormal condition is an event, incident or failure that:

- has happened and could happen again;
- is planned for (e.g., emergency actions cover such a situation, maintenance is undertaken to prevent it, etc.).

They should be identified by:

- using analysis processes that were capable of revealing abnormal conditions;
- employing a mix of personnel including competent safety/risk professionals and those with relevant domain knowledge and understanding to apply the processes;
- referencing relevant events and historic data; and
- documenting the results of the analysis.

1.5.9 Safety System: a designated system that:

- implements the required safety functions necessary to achieve or maintain a safe state for the equipment under control; and
- is intended to achieve, on its own or with other safety systems, the necessary safety needed for the required safety functions.

1.5.10 Safe State: the state of equipment under control when safety is achieved. For some situations, a safe state only exists so long as the equipment under control is continuously controlled. Such continuous control may be for a short or indefinite period.

1.5.11 System: a set of elements which interact according to a design, where an element of a system can be another system, called a sub-system, which may be a controlling system or a controlled system, and may include hardware, software and human interaction.

■ *Section 2*

Essential features for control, alarm and safety systems

2.1 General

~~*2.1.1* Where it is proposed to install control, alarm and safety systems to the machinery and equipment defined in 1.2.3, the applicable features contained in this Section are to be incorporated in the system design.~~

Existing paragraph 2.1.2 *has been renumbered* 2.1.1.

2.2 Control stations for machinery

~~*2.2.8* For additional requirements where control stations incorporate visual display units and keyboard input facilities, *see* 2.10.~~

2.3 Alarm systems, general requirements

~~*2.3.1* Where an alarm system, which will alert relevant personnel to faults, abnormal situations and other conditions requiring attention in the machinery and the safety and control systems, required by this Chapter or other Sections of the Rules is to be installed, the requirements of 2.3.2 to 2.3.20 are to be satisfied.~~

Existing paragraphs 2.3.2 *to* 2.3.20 *have been renumbered* 2.3.1 *to* 2.3.19.

2.4 Safety systems, general requirements

~~*2.4.1* Where safety systems are provided the requirements of 2.4.2 to 2.4.13 are to be satisfied. The requirements of this sub-Section apply, where relevant, to the safety systems installed on the equipment defined in 1.2.3, including those provided in addition to those safeguards required by Section 3 or other Sections of the Rules.~~

Existing paragraphs 2.4.2 *to* 2.4.13 *have been renumbered* 2.4.1 *to* 2.4.12.

2.5 Control systems, general requirements

~~*2.5.1* Where control systems are provided, the requirements of 2.5.2 to 2.5.8 are to be satisfied.~~

Existing paragraphs 2.5.2 *to* 2.5.5 *have been renumbered* 2.5.1 *to* 2.5.4.

~~*2.5.6*~~ *2.5.5* Remote or automatic controls are to be provided with ~~sufficient~~ suitable instrumentation at the relevant control stations to ensure effective control by duty personnel and to indicate that the system is functioning correctly.

Existing paragraphs 2.5.7 *to* 2.5.8 *have been renumbered* 2.5.6 *to* 2.5.7.

2.6 Bridge control for main propulsion machinery

~~*2.6.1* Where a bridge control system for main propulsion machinery is to be fitted, the requirements of 2.6.2 to 2.6.8 are to be satisfied.~~

Existing paragraphs 2.6.2 *to* 2.6.4 *have been renumbered* 2.6.1 *to* 2.6.3.

~~*2.6.5*~~ *2.6.4* Remote control of the propulsion machinery is to be from only one control station at any one time, *see also* 2.2.6. Main propulsion control units on the navigating bridge may be interconnected. Means are to be provided at the ~~main machinery~~ control station to ensure smooth transfer of control between the bridge and ~~machinery~~ other control stations.

Existing paragraphs 2.6.6 *to* 2.6.9 *have been renumbered* 2.6.5 *to* 2.6.8.

2.10 Programmable electronic systems – General requirements

2.10.16 Display units are to comply with the requirements of an acceptable National or International Standard, e.g., IEC 60950~~:2005, *Safety of information technology equipment*~~-*1: Information technology equipment – Safety - Part 1: General requirements*, in respect of emission of ionising radiation.

2.10.20 Software lifecycle activities, e.g., design, development, supply and maintenance, are to be carried out in accordance with an acceptable quality management system. Software quality plans are to be submitted. These are to demonstrate that the provisions of ISO/IEC 90003:~~2004,~~ Software engineering – *Guidelines for the application of ISO 9001:2000 to computer software*, or equivalent, are incorporated. The plans are to define responsibilities for the lifecycle activities, including verification, validation, module testing and integration with other components or systems.

2.14 Programmable electronic systems – Additional requirements for integrated systems

2.14.5 Where the integration involves control functions for essential services or safety functions, including fire, passenger, crew, and ship safety, a Failure Mode and Effects Analysis (FMEA) is to be carried out in accordance with IEC 60812~~,~~: *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*, or an equivalent and acceptable ~~n~~National or ~~i~~International ~~s~~Standard and the report and worksheets submitted for consideration. The FMEA is to demonstrate that the integrated system will ‘fail-safe’, *see* 2.4.6 and 2.5.4, and that essential services in operation will not be lost or degraded beyond acceptable performance criteria where specified by these Rules.

■ *Section 3*

Ergonomics of control stations

3.3 Physical environment

3.3.1 Control stations are to be positioned, as far as practicable, away from, or insulated against, sources of structurally transmitted vibration and noise, such as ventilation fans, engine intake fans and other noise sources.

3.3.9 ~~Chairs provided for use at control stations are to be adjustable to allow for varying heights of operators.~~ Seating provided for use at control stations is to allow for varying height and/or reach needs of operators. Seating arrangements are to minimise the need for twisting and/or turning motions by the operator.

3.5 Controls

3.5.12 Controls that affect the safe operation of the ship should be arranged so as to minimise the possibility of inadvertent operation.

3.6 Displays

3.6.2 Graphical symbols and colour coding are to be consistent. The graphical symbols of display functions are to be in accordance with a recognised International Standard, for example, ISO 14617~~,~~ (all parts): *Graphical symbols for diagrams*. Colour coding of functions and signals is to be in accordance with a recognised International Standard, for example, ISO 2412:~~1982,~~ *Shipbuilding – Colours of indicator lights*.

■ *Section 6*
Integrated computer control – ICC notation

6.1 General

6.1.2 A Failure Mode and Effects Analysis (FMEA) is to be carried out in accordance with IEC 60812: *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)* and the report and worksheets submitted for consideration. *See also* 2.14.5. The FMEA is to demonstrate that control and monitoring functions required by 6.2 will remain available at each operator station in the event of a single fault of the integrated computer control system, including input error, without adverse effect on the service(s).

6.1.3 Special consideration will be given to integrated computer control systems for other applications, except where these are addressed by other control engineering class notations. In particular, *see* Pt 7, Ch 9 for requirements of the optional class notation **IBS** – Integrated Bridge Navigation Systems~~, and Pt 7, Ch 12 for the requirements of the optional class notation **IFP** – Integrated Fire Protection~~.

Part 6, Chapter 2
Electrical Engineering

Effective Date 1 July 2014

■ *Section 1*
General requirements

1.9 Ambient reference and operating conditions

1.9.3 Main and essential auxiliary machinery and equipment is to operate satisfactorily under the conditions shown in Pt 5, Ch 1,3.6. Electrical equipment satisfying alternative ambient operating condition requirements for installation on ships contained in an acceptable and relevant National or International Standard may be considered to satisfy this requirement.

Note

Details of local environmental conditions are stated in Annex B of IEC 60092-101-2002: *Electrical installations in ships – Part 101: Definitions and general requirements*.

1.11 Location and construction

1.11.4 Equipment design and the choice of materials are to reduce the likelihood of fire, ensuring that:

(a) where the electrical energised part can cause ignition and fire, it is contained within the bounds of the enclosure of the electrotechnical product;

(b) the design, material(s) and construction of the enclosure minimises, as far as is practicable, any internal ignition causing ignition of adjacent materials; and

(c) where surfaces of the electrotechnical products can be exposed to external fire, they do not, as far as practicable, contribute to the fire growth.

Note

Compliance with IEC 60695: *Fire hazard testing* (all parts), or an alternative and acceptable Standard, will satisfy this requirement.

1.16 Operation under fire conditions

1.16.5 In addition to 1.11.4, materials used for electrical equipment, cables and accessories within passenger accommodation areas are not to be capable of producing excessive quantities of smoke and toxic products.

Note

Compliance with IEC 60695: ~~Fire hazard testing~~ *Fire hazard testing* (all parts), or an alternative and acceptable Standard, will satisfy this requirement.

■ *Section 5*
Supply and distribution

5.3 Isolation and switching

5.3.8 Tankers designed in accordance with IEC 60092-502: ~~*Electrical Installations in Ships – Tankers – Special Features*~~ *Electrical installations in ships – Part 502: Tankers – Special features, see* 14.1.2, are to meet the requirements of 5.3 of that Standard.

5.4 Insulated distribution systems

5.4.3 Tankers designed in accordance with IEC 60092-502: ~~*Electrical Installations in Ships – Tankers – Special Features*~~ *Electrical installations in ships – Part 502: Tankers – Special features* (*see* 14.1.2) are to meet the requirements of 5.3 of that Standard.

5.5 Earthed distribution systems

5.5.7 Tankers designed in accordance with IEC 60092-502: ~~*Electrical Installations in Ships – Tankers – Special Features*~~ *Electrical installations in ships – Part 502: Tankers – Special features* (*see* 14.1.2) are to meet the requirements of 5.3 of that Standard.

■ *Section 6*
System design – Protection

6.1 General

6.1.4 Protection systems are to be developed using a systematic design procedure incorporating verification and validation methods to ensure successful implementation of the requirements above. Details of the procedures used are to be submitted when requested. An approved copy of the details required by 1.2.5 and 1.2.6 is to be retained on board and made available to the Surveyor on request. Access to protection relays setpoints is to be restricted, such that they will generally only be adjusted by authorised personnel to avoid accidental operation. A record is to be kept of the initial setpoints and any subsequent changes made to them. These details are to be made available to the Surveyor on request.

6.3 Protection against overload

6.3.2 Fuses of a type intended for short-circuit protection only (e.g., fuse links complying with IEC 60269-1~~,~~: *Low-voltage fuses – Part 1: General requirements*, of type ‘a’) are not to be used for overload protection.

6.5 Circuit-breakers

6.5.4 Circuit-breaker selection is, and ratings are, to be in accordance with the relevant requirements of IEC 60092-202: *Electrical installations in ships – Part 202: System design – Protection*. Alternative methods acceptable to LR of selecting suitable circuit-breakers may be considered.

■ *Section 7*
Switchgear and controlgear assemblies

7.1 General requirements

7.1.1 Switchgear and controlgear assemblies and their components are to comply with one of the following standards, amended where necessary for ambient temperature and other environmental conditions:

(a) IEC 61439: *Low-voltage switchgear and controlgear assemblies* (relevant parts);
(b) IEC *62271-200: High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*;
(c) IEC 62271-201: *High-voltage switchgear and controlgear — Part 201: AC insulation-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV;*
(d) IEC 60255:~~ *Electrical relays*~~ *Measuring relays and protection equipment*;
(e) acceptable and relevant National Standard.

In addition, the requirements of 7.2 to 7.19 are to be complied with.

7.3 Circuit-breakers

7.3.1 Circuit-breakers are to comply with one of the following standards amended where necessary for ambient temperature:

(a) IEC 60947-2: ~~*Low voltage switchgear and Control gear Pt 2: Circuit breakers*~~ *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*; or
(b) IEC 62271-100: ~~*High voltage switchgear and control gear – Pt 100: High voltage alternating current circuit breakers*~~ *High-voltage switchgear and controlgear – Part 100: Alternating current circuit-breakers*; or
(c) an acceptable and relevant National Standard.

Type test reports to verify the characteristics of a circuit-breaker are to be submitted for consideration when required.

7.4 Contactors

7.4.1 High-voltage contactors are to comply with one of the following standards amended where necessary for ambient temperature~~.~~:

(a) IEC ~~60470: *High voltage alternating current contactors.*~~ 62271-106: *High-voltage switchgear and controlgear – Part 106: Alternating current contactors, contactor-based controllers and motor-starters*; or
(b) an acceptable and relevant National Standard.

Type test reports to verify the characteristics of a contactor are to be submitted for consideration when required.

7.5 Creepage and clearance distances

~~*7.5.1* The shortest distances between conductive parts and between conductive parts and earth in air or along the surface of an insulating material are to be suitable for the rated voltage, having regard to the nature of the insulating material and the transient over voltages developed by switching and fault conditions. This requirement may be satisfied by subjecting each assembly type to an impulse voltage test in accordance with its constructional Standard or, alternatively, maintaining the minimum distances for bare conductive parts in switchgear and control gear assemblies given in Table 2.7.1.~~

~~*7.5.2* Suitable shrouding or barriers are to be provided in way of connections to equipment, where necessary, to maintain the minimum distances in Table 2.7.1.~~

~~*7.5.3* Switchgear and control gear assemblies for rated voltages up to and including 1 kV are to have creepage distances in accordance with IEC 60092-302, *Electrical installations in ships – Part 302: Low voltage switchgear and control gear assemblies*, and Table 2.7.2.~~

~~*7.5.4* For switchgear and control gear assemblies for rated voltages up to and including 1 kV, a minimum creepage distance of 16 mm is permitted for type tested assemblies. The type tests are to include verification of the degree of protection, insulation material group and creepage and clearance distances in accordance with IEC 61439-1, *Low voltage switchgear and control gear assemblies – Part 1: General Rules*.~~

~~*7.5.5* Switchgear and control gear assemblies for rated voltages above 1 kV are to have creepage distances in accordance with IEC 60092-503, *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including 15 kV*. In the absence of alternative proposals including supporting design rationale, the distances stated in Table 2.7.2 are to be used, *see also* 1.3.4.~~

~~*7.5.6* For switchgear and control gear assemblies for rated voltages up to and including 1 kV, the type testing stated in Table 2.7.1 is to include verification of the degree of protection in accordance with a relevant International or National Standard.~~

7.5.1 The shortest distances between conductive parts and between conductive parts and earth, in air or along the surface of an insulating material, are to be suitable for the rated voltage having regard to:

- the nature of the insulating material;
- the transient over voltages developed by switching and fault conditions; and
- the environment into which the assembly will be installed.

Each assembly type is to be subjected to an impulse voltage test in accordance with its constructional Standard or, alternatively, the minimum distances for bare conductive parts in switchgear and control gear assemblies given in Table 2.7.1 are to be used.

7.5.2 For assemblies with a rated voltage of up to and including 1kV, the requirement of 7.5.1 may be met by complying with IEC 60092-302 *Electrical installations in ships – Part 302: Low-voltage switchgear and control gear assemblies*.

- Tables 2.7.1 and 2.7.2 indicate the minimum clearance and creepage distances normally allowed.
- For assemblies installed in spaces where the environmental conditions are in excess of pollution degree 3 (that is conductive pollution occurs or dry, non conductive pollution occurs which is expected to be conductive due to condensation) as defined in IEC 61439-1, *Low-voltage switchgear and control gear assemblies – Part 1: General requirements*; the clearance distances for non-verified assemblies are to be used.
- A minimum creepage distance of 16 mm is permitted for assemblies verified in accordance with the requirements of IEC 61439-2, *Low-voltage switchgear and control gear assemblies – Part 2: Power switchgear and control gear assemblies*.
- An alternative relevant National or International Standard may be used when an acceptable justification is submitted as part of the documentation required by 1.3.4.

7.5.3 For assemblies with a rated voltage above 1kV, the requirement of 7.5.1 may be met by complying with IEC 60092-503 *Electrical installations in ships – Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including 15 kV*.

- Tables 2.7.1 and 2.7.2 indicate the minimum clearance and creepage distances normally allowed.
- For main switchboards rated at above 1kV, a minimum clearance distance of 25 mm is required for busbars and other bare conductors.

An alternative relevant National or International Standard may be used when an acceptable justification is submitted as part of the documentation required by 1.3.4.

7.5.4 Suitable shrouding or barriers are to be provided in way of connections to equipment, where necessary, to maintain the minimum distances in Table 2.7.1.

~~**Table 2.7.1 Minimum clearance distances**~~

Nominal Voltage V	Minimum clearance (mm)			
	Main switchboards		Other switchgear and control gear	
	Type tested assemblies	Non-type tested assemblies	Type tested assemblies	Non-type tested assemblies
≤ 250	8	15	8	15
< 250 to ≤ 690	8	20	8	20
>690 to 1000	8	25	8	25
< 1,100	14	14	14	14
< 3,300	32	55	26	55
< 6,600	60	90	50	90
< 11,000	100	120	80	120
< 15,000	100	160	100	160

NOTE
A minimum clearance distance of 25 mm is required for busbars and other bare conductors in main switchboards.

Table 2.7.1 Minimum clearance distances

Nominal voltage (V)	Minimum clearance distance (mm)		
	Verified assemblies, *see* Note 2		Non-verified assemblies
	Main switchboards	Other switchgear and control gear	Main switchboards and other switch and control gear
≤ 250 (*see* Note 1)	8	8	15
≤ 690 (*see* Note 1)	8	8	20
≤ 1000 (*see* Note 1)	8	8	25
< 3,300	32	26	55
< 6,600	60	50	90
< 11,000	100	80	120
≤15,000	*See* Note 3	*See* Note 3	160

NOTES
1. For assemblies installed in spaces where the pollution degree is > 3, *see* 7.5.2.
2. For the verification requirements for a verified assembly refer to IEC 61439-2.
3. Clearance distances with reference to the applicable relevant National or International Standards, are to be submitted for approval, *see* 1.3.4.

~~**Table 2.7.2 Minimum creepage distances**~~

Nominal Voltage V	Minimum creepage distance (mm)	
	Main switchboards	Other switchgear and control gear
≤ 250	20	20
> 250 to ≤ 690	25	25
> 690 to 1000	35	35
< 3,300	48	35
< 6,600	90	70
< 11,000	150	120
≤ 15,000	150	120

NOTE
A minimum creepage distance of 16 mm is permitted for type tested assemblies for rated voltages up to and including 1 kV, *see* 7.5.4.

Table 2.7.2 Minimum creepage distances

Nominal voltage (V)	Minumum creepage distance (mm)	
	Main switchboards	Other switchgear and control gear
≤ 250 (*see* Note 1)	20	20
≤ 690 (*see* Note 1)	25	25
≤ 1000 (*see* Note 1)	35	35
< 3,300	48	*See* Note 2
< 6,600	90	70
< 11,000	150	120
≤15,000	*See* Note 2	*See* Note 2

NOTES
1. For verified assemblies a minimum creepage distance of 16 mm is permitted for LV switchboards, *see* 7.5.2.
2. Creepage distances, with reference to the applicable relevant National or International Standards, are to be submitted for approval, *see* 1.3.3.

7.8 Earthing of high-voltage switchboards

7.8.2 Protective shutters associated with withdrawable parts are to be clearly marked~~, e.g., by colour coding,~~ to indicate the incoming and outgoing circuits and bus tie connections. The colour coding shall be as follows:

- Incoming (busbar side) – red;
- Outgoing (circuit side) – yellow; and
- Bus ties – red.

7.9 Fuses

7.9.1 Fuses are to comply with one of the following Standards, amended where necessary for ambient temperature:

(a) IEC 60269 (all parts): *Low-voltage fuses*;
(b) IEC 60282-1: *High-voltage fuses — Part 1: Current-limiting fuses*;
(c) acceptable and relevant National Standard for enclosed current-limiting fuses.

Type test reports to verify the characteristics of a fuse are to be submitted for consideration when required.

7.16 Position of switchboards

7.16.5 For switchgear and control gear assemblies, for rated voltages above 1 kV, arrangements are to be made to protect personnel in the event of gases or vapours escaping under pressure as the result of arcing due to an internal fault. Where personnel may be in the vicinity of the equipment when it is energised, this may be achieved by an assembly that has been tested in accordance with Annex A of IEC 62271-200:2011: *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV* and qualified for classification **IAC** (internal arc classification).

7.18 Testing

7.18.5 For switchgear and control gear assemblies, for rated voltages above 1 kV, type tests are to be carried out, in accordance with Annex A of IEC 62271-200:2011: *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV* and **IAC** (internal arc classification) assigned, to verify that the assembly will withstand the effects of an internal arc occurring within the enclosure at a prospective fault level equal to, or in excess of, that of the installation.

7.19 Disconnectors and switch-disconnectors

7.19.1 Disconnectors, switch-disconnectors and their components are to comply with one of the following standards, amended where necessary for ambient temperature and other environmental conditions:

(a) IEC 60947-3: ~~*Low voltage switchgear and control gear Part 3: switches, disconnectors, switch-disconnectors and fuse combination units*~~ *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*;
(b) IEC 62271-102: *High-voltage switchgear and control gear – Part 102: High-voltage alternating current disconnectors and earthing switches*;
(c) acceptable and relevant National Standard.

Type test reports to verify the characteristics of a disconnector or switch-disconnector are to be submitted for consideration when required.

■ *Section 9*
Rotating machines

9.1 General requirements

9.1.1 Rotating machines are to comply with the relevant parts of IEC 60092~~,~~: *Electrical installations in ships* or an acceptable and relevant National Standard, and the requirements of this Section.

9.1.6 The rotating parts of machines are to be so balanced that when running at any speed in the normal working range the vibration does not exceed the levels of IEC 60034~~: *Rotating electrical machines Part 14.*~~-14: *Rotating electrical machines – Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of vibration severity*.

9.1.14 For high voltage machines, the stator insulation system is to be of a type that has undergone sample testing in accordance with the following International Standards, or relevant alternatives acceptable to LR, to demonstrate its suitability for the operating voltage in the presence of an LR Surveyor:

(a) IEC 60894, *Guide for ~~a~~ test procedure for the measurement of loss tangent of coils and bars for machine windings*, at the insulation class rated temperature; and
(b) IEC 60034-15~~, *Impulse Voltage Withstand Levels of Form-wound Stator Coils for Rotating a.c. Machines*~~ : *Rotating electrical machines – Part 15: Impulse voltage withstand levels of form-wound stator coils for rotating a.c. machines*, with power-frequency voltage withstand testing conducted.

Test samples are to be representative in terms of the number and size of conductors, coil construction, combination of materials and manufacturing process.

9.8 Survey and testing

9.8.6 Routine impulse tests are to be carried out on the coils of high voltage machines in accordance with IEC 60034-15~~, *Impulse Voltage Withstand Levels of Form-wound Stator Coils for Rotating a.c. Machines*~~:*Rotating electrical machines – Part 15: Impulse voltage withstand levels of form-wound stator coils for rotating a.c. machines*, in order to demonstrate a satisfactory withstand level of the inter-turn insulation to voltage surges. The test is to be carried out on all coils after they have been inserted in the slots and after wedging and bracing. Each coil shall be subjected to at least five impulses of injected voltage, the peak value of the injected voltage being given by the formula:

$V_{peak} = 2{,}45V$

where

V = rated line voltage r.m.s.

Alternative proposals to demonstrate the withstand level of inter-turn insulation will be considered.

■ *Section 10*
Converter equipment

10.1 Transformers

10.1.2 Transformers are to comply with the requirements of IEC 60076 (all parts): *Power transformers*, or an acceptable and relevant National Standard amended where necessary for ambient temperature, *see* 1.9.

10.2 Semiconductor ~~equipment~~ converters

10.2.1 The requirements of 10.2.2 to 10.2.18 apply to semiconductor ~~equipment~~ converters rated for 5 kW upwards.

10.2.2 Semiconductor ~~equipment is~~ converters are to comply with the requirements of IEC 60146 (all parts): *Semiconductor converters*, or an acceptable and relevant National Standard amended where necessary for ambient temperature, *see* 1.9.

10.2.3 Semiconductor static power converters ~~equipment is~~ are to be rated for the required duty having regard to peak loads, system transients and overvoltage.

10.3 Uninterruptible power systems

10.3.2 UPS units are to be constructed in accordance with IEC 62040: *Uninterruptible power systems (UPS)* (all parts), or an acceptable and relevant National or International Standard.

10.3.8 UPS units utilising valve-regulated sealed batteries may be located in compartments with standard marine or industrial electrical equipment provided that the arrangements comply with 12.3.5. Ventilation arrangements in accordance with IEC 62040-1: *Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS*, or an acceptable and relevant National or International Standard, may be considered to satisfy the requirements of 12.5.10.

■ *Section 11*
Electric cables, optical fibre cables and busbar trunking systems (busways)

11.1 General

Table 2.11.1 Electric cables

Application	IEC Standard	Title
General constructional and testing requirements	60092–350	~~Low-voltage shipboard power cables. General construction and test requirements~~ Electrical installations in ships – Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications
Fixed power and control circuits	60092–353	~~Single and multicore non-radial field power cables with extruded solid insulation for rated voltages 1 kV and 3 kV~~ Electrical installations in ships – Part 353: Power cables for rated voltages 1 kV and 3 kV
Fixed power circuits	60092–354	~~Single and three-core power cables with extruded solid insulation for rated voltages 6 kV, 10 kV and 15 kV~~ Electrical installations in ships – Part 354: Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)
Instrumentation, control and communication circuits up to 60 V	60092-370	Electrical installations in ships – Part 370: Guidance on the selection of cables for telecommunication and data transfer including radio-frequency cables
Control circuits and instrumentation up to 250 V	60092–376	~~Shipboard multicore cables for control and instrumentation circuits~~ Electrical installations in ships – Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)
Mineral insulated	60702 (all parts)	Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V

11.2 Testing

11.2.1 Routine tests, consisting of at least:

(a) measurement of electrical resistance of conductors;
(b) high voltage test, *see also* Section 21;
(c) insulation resistance measurement;
(d) for high voltage cables, partial discharge tests are to be made in accordance with the requirements of IEC 60885-2~~,~~: *Electrical test methods for electric cables*~~.~~ *— Part 2: Partial discharge tests*, or an acceptable and relevant National Standard, at the manufacturer's works prior to despatch.

Evidence of successful completion of routine tests is to be provided by the manufacturer, *see also* 11.1.4.

11.5 Construction

11.5.3 Where electric or optical fibre cables are required to be of a 'fire resistant type', they are in addition to be easily distinguishable and comply with the performance requirements of the appropriate part of IEC 60331: *Tests for electric cables under fire conditions – Circuit integrity,* ~~*when tested with a minimum flame application time of 90 minutes*~~ when tested with a minimum flame application time of 90 minutes, as follows:

- IEC 60331-1~~,~~: *Tests for electric cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm*;
- IEC 60331-21: *Tests for electric cables under fire conditions – Circuit integrity – Part 21*: *Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV*;
- IEC 60331-23: *Tests for electric cables under fire conditions – Circuit integrity – Part 23*: *Procedures and requirements – Electric data cables*; or
- IEC 60331-25: *Tests for electric cables under fire conditions – Circuit integrity – Part 25*: *Procedures and requirements – Optical fibre cables*.

11.8 Installation of electric cables

11.8.10 Where electric and optical fibre cables are installed in bunches, provision is to be made to limit the propagation of fire. This requirement is considered satisfied when cables of the bunch have been tested in accordance with the requirements of IEC 60332-3-22: *Tests on electric and optical fibre cables under fire conditions*~~,~~ *— Part 3-22*~~,~~: *Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A*, and are installed in the same configuration(s) as are used for the test(s). If the cables are not so installed, information is to be submitted to demonstrate satisfactorily that suitable measures have been taken to ensure that an equivalent limit of fire propagation will be achieved for the configurations to be used. Particular attention is to be given to cables in:

- atria or equivalent spaces; and
- vertical runs in trunks and other restricted spaces.

In addition, cables that comply with the requirements of IEC 60332-3-22 are also required to meet the requirements of IEC 60332-1-2: *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*.

11.13 Non-metallic cable support systems, protective casings and fixings

11.13.7 Non-metallic fixings are to be flame retardant in accordance with the requirements of IEC 60092-101: *Electrical installations in ships – Part 101: Definitions and general requirements*, or an alternative~~,~~ relevant National or International Standard.

■ *Section 12*
Batteries

12.3 Location

12.3.10 Only electrical equipment necessary for operational reasons and for the provision of lighting is to be installed in compartments provided in compliance with 12.3.1, the compartment ventilation exhaust ducts and zones within a 1,5 m radius of the ventilation outlet(s). Such electrical equipment is to be certified for group IIC gases and temperature Class T1 in accordance with the applicable parts of IEC 60079: ~~*Electrical apparatus for explosive gas atmospheres*~~ *Explosive atmospheres*, or an acceptable and relevant National Standard.

■ *Section 14*
Electrical equipment for use in explosive gas atmospheres or in the presence of combustible dusts

14.1 General

~~*14.1.5* Details of installations in paint stores that satisfy the requirements of alternative and relevant standards acceptable to LR may be submitted for consideration.~~

14.2 Selection of equipment for use in explosive gas atmospheres

14.2.1 When equipment is to be installed in areas where an explosive gas atmosphere may be present, it is generally to be of a type providing protection against ignition of the gases encountered and compliant with the relevant Parts of IEC 60079~~,~~: ~~*(Electrical Apparatus for) Explosive Gas Atmospheres*~~ *Explosive atmospheres*, or an acceptable and relevant National Standard, unless permitted otherwise by 14.2.4, 14.2.5 or 14.2.6.

14.2.4 In **zone 0**, the following may be considered:

(a) intrinsically safe, category 'a' (Ex 'ia'); or
(b) simple electrical apparatus and components (for example thermocouples, photocells, strain gauges, junction boxes, switching devices), included in intrinsically safe

circuits of category ‘ia’, not capable of storing or generating electrical power or energy in excess of the limits given in IEC 60079-14~~,~~: *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*.

14.2.6 In **zone 2**, the following may be considered:

(a) apparatus permitted within **zone 0** or **zone 1**;
(b) type of protection ‘n’ or ‘N’;
(c) equipment such as control panels, protected by purging and pressurisation and capable of being verified by inspection as meeting the requirements of IEC 60079-2: *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosures "p"*;or
(d) radio aerials having robust construction, meeting the relevant requirements of IEC 60079-15: *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*. Additionally, in the case of transmitter aerials, it is to be shown, by detailed study or measurement, or by limiting the peak radiated power and field strength to 1 W and 30 V/m, respectively, that they present negligible risk of inducing incendive sparking in adjacent structures or equipment.

14.2.9 Consideration may also be given to other types of protection, selected in accordance with the requirements of IEC 60079-14: *Explosive atmospheres – Part 14: Electrical installations design, selection and erection* or arrangements complying with IEC 60092-502~~,~~: ~~*Electrical Installations in Ships – Tankers – Special Features*~~ *Electrical installations in ships – Part 502: Tankers – Special features*, *see also* 14.10 to 14.12.

14.3 Selection of equipment for use in the presence of combustible dusts

14.3.5 Consideration may also be given to arrangements complying with IEC 60092-506~~,~~: *Electrical Installation in ~~S~~ships – Part 506: Special ~~F~~features – Ships carrying specific dangerous goods and materials hazardous only in bulk*.

14.4 Installation of electrical equipment

14.4.1 The method of installation and application of electrical equipment suitable for use in explosive gas atmospheres or in the presence of combustible dusts is to be in accordance with IEC 60079-14: *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*, or the national code of practice relevant to the standard with which the equipment complies. ~~Any special requirements laid down by the equipment certification documentation are also to be observed.~~ The ambient temperature range for which the apparatus is certified is to be taken to be –20°C to 40°C, unless otherwise stated, and account is to be taken of this when assessing the suitability of the equipment for the auto-ignition temperature of the gases and dusts encountered. Any special requirements laid down by the equipment certification documentation are also to be observed.

14.5 Hazardous zones and spaces

14.5.1 Hazardous zones or spaces and sources of hazard for ships intended for the carriage in bulk of oil, liquefied gases and other hazardous substances, ~~and~~ the requirements for ships carrying vehicles with fuel in their tanks and the requirements for ships with spaces for storing paint, are defined (either directly, or by reference to other documents) in 14.10 to ~~14.14~~ 14.15.

14.5.2 Hazardous areas associated with flammable liquids or gases are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

- **zone 0**: place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently
- **zone 1**: place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally
- **zone 2**: place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

See IEC 60079-10~~, *Electrical apparatus for explosive gas atmospheres: Classification of hazardous areas*~~ *-1: Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*.

14.5.3 Hazardous areas associated with solid substances or packaged liquids to which 14.14 applies are classified into zones based upon the frequency of the occurrence and duration of an explosive atmosphere due to the presence of gas and/or dust, as follows:

- **hazardous area**: area in which an explosive atmosphere is likely to occur in normal operation (comparable with **zone 1**)
- **extended hazardous area**: area in which an explosive atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only (comparable with **zone 2**).

See IEC 60079-10-2~~,~~: *Explosive atmospheres — Part 10-2: Classification of areas – Combustible dust atmospheres*, or IEC 60092-506~~,~~: *Electrical Installation in ~~S~~ships – Part 506: Special ~~F~~features – Ships carrying specific dangerous goods and materials hazardous only in bulk*. An explosive atmosphere may exist due to gas and/or dust.

14.5.4 The following principles are to apply in general, and where any specific arrangement does not fall into any of the categories covered by 14.10 to ~~14.14~~ 14.15.

14.9 Cable and cable installation

14.9.5 Cables associated with intrinsically safe circuits are to be used only for such circuits. They are to be physically separated from cables associated with non-intrinsically safe circuits, e.g., neither installed in the same protective casing nor secured by the same fixing clip. Consideration may be given to other arrangements complying with IEC 60079-14~~,~~: *Explosive atmospheres — Part 14: Electrical installations design, selection and erection*.

14.10 Requirements for tankers intended for the carriage in bulk of oil cargoes having a flash point not exceeding 60°C (closed-cup test)

14.10.1 In order to eliminate potential sources of ignition from hazardous areas on board tankers in accordance with SOLAS 1974 as amended, Chapter II-1, Regulation 45.11, electrical equipment is to be selected and installed in accordance with IEC 60092:~~ Electrical installations in ships – Part 502: Tankers – Special features~~ *Electrical installations in ships – Part 502: Tankers – Special features*.

14.13 Special requirements for ships with spaces for carrying vehicles with fuel in their tanks, for their own propulsion

14.13.1 **Passenger ships with special category spaces above the bulkhead deck for carrying vehicles**:

(a) electrical equipment fitted within a height of 45 cm above the vehicle deck, or any platform on which vehicles are carried, or within the exhaust ventilation trunking for the space, is to be of a type acceptable for **zone 1**;

(b) electrical equipment situated elsewhere within the space is to be of a type acceptable for **zone 2**, or is to have an enclosure of ingress protection rating of at least IP55, *see* IEC 60529: ~~*Classification of Degrees of Protection Provided by Enclosures*~~ *Degrees of protection provided by enclosures (IP Code)*. Smoke and gas detector heads are exempt from this requirement.

14.14 Special requirements for ships intended for the carriage of dangerous goods and materials hazardous only in bulk

14.14.2 Electrical equipment essential for the safety and operation of the ship is to be of a type providing protection against ignition of the gases and/or dusts that can be present, selected in accordance with IEC 60092-506~~,~~: *Electrical installations in ships – Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk*.

14.14.3 In addition to the requirements of IEC 60092-506: *Electrical installations in ships – Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk*, pipes such as ventilation and bilge pipes~~,~~ having ends opening into a hazardous area are to be considered a hazardous area. Enclosed spaces such as pipe tunnels and bilge pump-rooms containing such pipes and with equipment and components such as pumps, valves and flanges are to be considered as extended hazardous areas unless protected by overpressure.

14.15 Requirements for ships with spaces for storing paint

14.15.1 In order to eliminate potential sources of ignition in paint stores, electrical equipment is to be selected as follows:

(a) electrical equipment fitted within the space and within the exhaust ventilation trunking for the space is to be of a type acceptable for **zone 1**;

(b) electrical equipment situated within 1 m of inlet and exhaust ventilation openings or within 3 m of exhaust mechanical ventilation outlets is to be of a type acceptable for **zone 2**, or is to have an enclosure of ingress protection rating of at least IP55, *see* IEC 60529, *Classification of Degrees of Protection Provided by Enclosures*. *See* 1.11.1 for degrees of protection required for equipment on open deck.

14.15.2 A space having access to a paint store may be regarded as non-hazardous if fulfilling all of the following conditions:

(a) access is by means of a self-closing gastight steel door without any hold-back arrangement;

(b) the paint store is ventilated from a non-hazardous area and;

(c) warning notices are fitted adjacent to the paint store entrance warning of flammable liquids contained in paint store.

NOTE
A watertight door may be considered as being gastight.

14.15.3 The relevant group and temperature class for electrical equipment in hazardous zones are, respectively, IIB and T3.

■ *Section 16*
Electric propulsion

16.5 Protection of propulsion system

Table 2.16.1 Electric propulsion equipment: Alarms and safeguards

Item	Alarm	Note
Electric propulsion equipment ventilation and cooling medium temperature	High	*See* 16.1.2 and 16.3.8
Electric propulsion transformer winding temperature	High	*See* 10.1.11
Electric propulsion generator excitation	Overload	*See* 16.5.6
Electric propulsion generators and motors winding temperature	High	*See* 16.1.3
Electric propulsion generator and motor ~~lubricating oil~~ bearing temperature	High	*See* 9.1.11
Electric propulsion generator and motor lubricating oil supply pressure	Low	*See* 9.1.12
Electric propulsion generator and motor lubricating oil temperature	High	*See* 9.1.13
~~Power limitation~~	—	~~Indication, *see* 16.4.8 and 16.4.9~~

Section 18
Crew and passenger emergency safety systems

18.4 Escape route or low location lighting (LLL)

18.4.4 The performance and installation of lights and lighting assemblies are to comply with ISO ~~Standard~~ 15370: *Ships and marine technology – Low location lighting on passenger ships — Arrangement.*

Section 19
Ship safety systems

19.2 Stern and side shell doors and bow and inner doors

19.2.9 Detection of door position and securing and locking device status is to be by direct sensing of proximity, contact or equivalent, not inferred from actuator positions. Sensors are to be protected against ice formation, mechanical damage and water ingress to be not less than IPX6 Standard as defined in IEC 60529: *Degrees of protection provided by enclosures (IP Code)*, or an acceptable and relevant National Standard.

Section 20
Lightning conductors

20.1 General

20.1.1 In order to minimise the risks of damage to the ship and its electrical installation due to lightning, ships having non-metallic masts or topmasts are to be fitted with lightning conductors in accordance with the applicable requirements of IEC 60092-401: *Electrical installations in ships*~~.~~ — Part 401: ~~Installation and test of completed installation~~ *Installation and test of completed installation* or an alternative and relevant National Standard.

Part 7, Chapter 9
Navigational Arrangements and Integrated Bridge Systems

Effective Date 1 July 2014

Section 3
Workstations

3.1 Navigation workstation

3.1.12 A speed log or alternative means of indicating the ship’s speed and distance over ground is to be provided, which is to be separate from the device required by 3.1.11. Speed over ground is to be indicated in both the fore-aft and athwartships directions.

Part 7, Chapter 11

Arrangements and Equipment for Environmental Protection (ECO Class Notation)

Effective Date 1 July 2014

Section 1
General requirements

1.1 Application

1.1.2 Compliance with this Chapter is optional. An LR classed ship meeting the requirements of this Chapter will be eligible for **ECO** class notation, which will be recorded in the *Register Book*.

1.3 Transfer of class ships

1.3.1 A ship classed with another IACS class society that transfers to LR class will be eligible for the class notation **ECO(TOC)** if it holds the previous society's environmental class notation at the time of the transfer of class. However, ships with **ECO(TOC)** notation are not eligible for any of the supplementary characters listed in 1.2.2.

1.3.2 To maintain the **ECO(TOC)** notation a ship must implement and maintain the operational procedures listed in 1.5.4, as applicable.

Existing sub-Section 1.3 *has been renumbered* 1.4.

~~1.3~~ 1.4 Definitions

(*Part only shown*)
~~*1.3.1*~~ *1.4.1* The following definitions are applicable:

- **Grey water** is drainage from ~~dishwater, shower, laundry, bath and washbasin drains and excludes drainage from hospitals~~ dishwater, galley sink, shower, laundry, bath and washbasin drains and does not include drainage from toilets, urinals, hospitals, and animal spaces, as defined in Regulation 1.3 of MARPOL Annex IV and does not include drainage from cargo spaces.

Existing sub-Sections 1.4 *and* 1.5 *have been renumbered* 1.5 *and* 1.6.

Section 2
~~Core~~ Minimum requirements

2.1 General

2.1.6 ~~Offshore supply ships, as defined in Pt 7, Ch 4 of the Rules for Ships, will be the subject of special consideration.~~ Offshore supply vessels that are less than 100 m in length, as per MSC 235(82), are exempt from the requirement to be enrolled in LR's Ship Emergency Response Service (SERS) or the equivalent scheme of another IACS member.

2.7 Oil pollution prevention

2.7.11 For ships delivered after 1 August 2010, ~~all oil fuel~~ fuel oil tanks with a capacity of greater than 60 m^3, except overflow tanks, are to be located in a protected location away from the ship's side or bottom shell plating. Tanks are to be located ~~The location of tanks is to be~~ in accordance with the requirements relating to ~~oil fuel~~ fuel oil tank protection given in MARPOL Annex I, Regulation 12A.

Section 3
Supplementary characters

3.12 Protected oil tanks – P character

3.12.2 Oil fuel, lubricating oil and hydraulic oil tanks are to be located ~~The location of the oil fuel, lubricating oil and hydraulic oil tanks is to be~~ in accordance with the requirements relating to ~~oil fuel~~ fuel oil tank protection given in MARPOL Annex I, Regulation 12A, paragraphs 6, 7 and 8. The performance standard specified in paragraph 11 of Regulation 12A will not be accepted.

3.14 Sulphur oxides – DIST and SOx character

3.14.1 For assignment of the **DIST** character, ships must meet the requirements of ~~Lloyd's Register's~~ LR's Descriptive Note **DIST(M, AB, I, IG)**, as applicable.

3.15 Enhanced tank cleaning – TC character

3.15.3 ~~Permanent tank washing machines, of a design and method of support acceptable to LR, are to be installed in each cargo tank.~~ Permanent tank washing machines shall be type approved in accordance with the revised IMO Resolution A.446(XI) - *Revised Specifications for the Design, Operation and Control of Crude Oil Washing Systems*, and their method of support is to be acceptable to LR.

Section 4
Survey requirements

4.1 Initial Survey and Audit

4.1.1 Following satisfactory review of the plans and other information submitted, (*see* ~~1.4~~ 1.5), an **ECO** Initial Survey is to be undertaken for ships under construction or in service.

4.1.3 Following the successful completion of the Initial Survey, the **ECO** notation may be assigned to a ship. The **ECO** notation will be valid, in the first instance~~, for a period not exceeding 12 months~~ until the first **ECO** Annual Survey. ~~During this period~~ At the first Annual Survey, an audit of the operational procedures as required by these Rules is to be undertaken. ~~This audit is to be performed after the procedures have been fully implemented, subjected to internal audit and have generated at least 3 months of records under in-service conditions.~~ Prior to the LR audit, the operational procedures must have been fully implemented and audited by the Operator and the applicable record books must contain in-service records for a period of at least 3 months.

4.2 Periodical Surveys and Audits

4.2.5 Where the periodical surveys and audits identify non-conformances, the **ECO** notation will be suspended. Re-instatement will be as directed by the Classification Committee, appropriate to the circumstances of the case.

4.3 Change of company

4.3.2 The new company may adopt the previously approved procedures as required by these Rules or may compile new procedures~~ which would need to be submitted for approva~~l.

~~Part 7, Chapter 12~~

~~Integrated Fire Protection (IFP) Systems~~

Effective Date 1 July 2014

Existing Chapter 12 has been deleted in its entirety.

Existing Chapters 13 *to* 16 *have been renumbered* 12 *to* 15.

Part 7, Chapter ~~13~~ 12

Passenger and Crew Accommodation Comfort

Effective Date 1 July 2014

Existing Chapter 13 *has been renumbered Chapter* 12.
Please see Cross-references back pages for further changes.

■ *Section 1*
General requirements

1.1 Scope

1.1.2 ~~Compliance with these Rules is optional.~~ The requirements of this Chapter may be applied where no other statutory requirements exist.

1.1.4 Spaces that comply with the noise level limits specified in Table 12.2.4 and under Acceptance Numeral 3 in Tables 12.2.1 and 12.2.3, will meet the requirements of section 4 of IMO Resolution MSC.337(91), when measured in accordance with the requirements of Chapters 2 and 3 of that Resolution.

1.1.5 Spaces that comply with the noise level limits specified under Acceptance Numerals 1 and 2 in Tables 12.2.1 and 12.2.3, will achieve enhanced levels of passenger and crew comfort as applicable, when measured in accordance with the requirements of Chapters 2 and 3 of IMO Resolution MSC.337(91). All vessels can apply for *Acceptance Numerals 1 and 2.*

Existing paragraphs 1.1.4 *to* 1.1.7 *have been renumbered* 1.1.6 *to* 1.1.9.

1.2 Definitions

1.2.4 **Vibration level** is defined by the application of ~~either of the two versions of the~~ ISO 6954:2000~~ standard~~:

~~(a) Where ISO 6954:1984 is applied, the vibration level is defined as the single amplitude peak value of deck structure vibration during a period of steady state vibration, representative of maximum repetitive behaviour, in mm/s, over the frequency range 5 to 100 Hz. For frequencies below 5 Hz, the requirements for vibration levels follow constant acceleration curves corresponding to the acceleration at 5 Hz.~~

~~(b) Where ISO 6954:2000 is applied, t~~The vibration level is defined as the overall frequency weighted r.m.s. value of vibration during a period of steady-state operation over the frequency range 1 to 80 Hz.

~~In general, ISO 6954 2000 is the preferred standard to be applied, however ISO 6954 1984 may be applied where there are practical difficulties in application of ISO 6954 2000 and this has been agreed between the Owner and Builder.~~

■ *Section 2*
Noise

2.3 Crew accommodation and work areas

2.3.2 Crew space insulation is to comply with the requirements of IMO Resolution ~~A.468(XII)~~ MSC.337(91).

~~Table 13.2.3 Crew accommodation – Maximum~~ noise levels in dB(A)

Location	Acceptance Numeral		
	1	2	3
Sleeping cabins, hospitals	52	55	60
Day cabins	55	60	60
Office conference rooms	55	60	65
Mess rooms, lounges, reception areas:			
Within accomodation	57	60	65
On open decks	67	72	75
Alleyways, changing rooms, bathrooms, lockers	70	75	75
NOTE The levels may be exceeded by 5 dB(A) within 3 m of a ventilation inlet/outlet or machinery intake/uptake on open decks.			

Table 12.2.3 Crew accommodation – Maximum noise levels in dB(A)

Location	Acceptance Numeral			
	1	2	3	
			Ships <10,000 grt	Ships ≥10,000 grt
Sleeping cabins, hospitals	50	53	60	55
Offices, conference rooms and day cabins	55	58	65	60
Mess rooms, lounges, reception areas and recreation rooms within accommodation	55	58	65	60
Recreation areas on open deck	67	72	75	75
Alleyways, changing rooms, bathrooms, lockers	70	75	75	75
NOTE The levels may be exceeded by 5dB(A) within 3 m of a ventilation inlet/outlet or machinery intake/uptake on open decks.				

(*Part only shown*)

Table ~~13.2.4~~ 12.2.4 Crew work areas – maximum noise levels in dB(A)

Location	dB(A) level
Workshops and non-specified work spaces	85
Machinery control rooms	75
Wheelhouse	65
~~Bridge wing, additional limits:~~ ~~• 250 Hz band~~ ~~• 500 Hz band~~	~~68~~ ~~63~~
Look-out posts e.g., at bridge wing or window Additional limits: • 250 Hz band • 500 Hz band (measured according to IMO A.343(IX))	70 68 63

2.4 Maximum noise levels

2.4.2 Guidance on maximum acceptable sound pressure levels and noise exposure limits for crew spaces is given in IMO Resolution ~~A.468(XII)~~ MSC.337(91).

2.5 Impact insulation

(*Part only shown*)

Table ~~13.2.5~~ 12.2.5 Passenger cabins normalised impact maximum sound pressure level $L_{n,w}$

Location	dB
Below dance floors, theatre or sports rooms	~~47~~ 45

Section 3
Vibration

3.1 Assessment criteria

Table ~~13.3.1~~ 12.3.1 Passenger ship – Maximum vibration levels

Standard	~~ISO 6954:1984~~			ISO 6954:2000		
Units:	~~Peak velocity (5–100 Hz)~~			Peak velocity (~~5~~1–80 Hz) velocity mm/s rms		
	Acceptance Numeral					
Location	~~1~~	~~2~~	~~3~~	1	2	3
Passenger cabin Luxury	~~1,5~~	~~2,0~~	~~2,5~~	1,5	1,8	2,1
Passenger cabin Standard	~~1,5~~	~~2,5~~	~~4,0~~	1,8	2,1	2,4
Public spaces	~~1,5~~	~~2,5~~	~~4,0~~	2,0	2,5	3,0
Open recreation decks	~~2,5~~	~~3,5~~	~~5,0~~	2,5	3,0	3,5
NOTE The vibration level may be exceeded by 0,3 mm/s in the ship's aft body directly above the propellers.						

Table ~~13.3.2~~ 12.3.2 Crew spaces – Maximum vibration levels

Standard:	~~ISO 6954:1984~~	ISO 6954:2000
Units:	~~Peak velocity (5–100 Hz)~~	Frequency weighted (1–80 Hz) velocity mm/s rms
Location		
Accommodation and navigation spaces	~~5,0~~	3,5
Work spaces	~~6,0~~	5,0

~~*3.1.5* The vibration levels for ISO 6954:1984 are stated as peak vibration velocity amplitude. If root mean square levels are measured, each frequency component may be converted to peak vibration velocity amplitude by application of a 1.41 multiplication factor where the ISO 6954:1984 is used for assessment against Tables 13.3.1 and 13.3.2. An approximation of maximum repetitive values may be obtained for direct comparison with the graph in ISO 6954-1984 by further application of the 1,8 conversion factor as stated in the 'Interim guidelines' note of the standard.~~

3.2 Passenger accommodation and public spaces

3.2.2 No more than 20 per cent of all passenger spaces/areas and public spaces should exceed the relevant vibration criteria specified in Tables ~~13.3.1~~ 12.3.1 and ~~13.3.2~~ 12.3.2 by more than 0,3 mm/s ~~whether using ISO 6954:2000 or ISO 6954:1984~~.

Section 4
Testing

4.2 Test conditions

4.2.1 Test conditions for the surveys are to be in accordance with those detailed in ISO 2923 and ~~ISO 6954:1984 or~~ ISO 6954:2000 as applicable.

4.3 Noise measurements

4.3.1 Noise measurements are to be conducted in accordance with ISO 2923 and IMO Resolution ~~A.468(XII)~~ MSC.337(91). Measurements of noise levels are to be carried out using precision grade sound level meters conforming to IEC 60651, Type 1 or 2. Subject to demonstration, equivalent standards are acceptable.

4.4 Noise measurement locations

4.4.1 Measurement locations are to be chosen so that the assessment represents the overall noise environment on board the ship. In addition to the requirements of IMO Resolution ~~A.468(XII)~~ MSC.337(91) for crew spaces, all public spaces and at least 50 per cent of passenger cabins in the after third of the ship, and 25 per cent elsewhere, are to be surveyed. Distribution of the measurement locations is to be agreed by LR.

4.5 Vibration measurements

4.5.1 Vibration measurements are to be conducted in accordance with ~~ISO 6954:1984 or~~ ISO 6954:2000.

■ *Section 5*
Noise and vibration survey reporting

5.2 Noise

(*Part only shown*)

5.2.1 The reporting of results is to comply with ISO 2923 and IMO Resolution MSC.337(91), and is to include:

5.3 Vibration

5.3.1 The report is to contain the following information:

~~(c) Where ISO 6954:1984 is used, the maximum peak vibration levels and their corresponding frequencies taken from the frequency spectra, tabulated for all measurement locations.~~

Existing paragraphs 5.3.1 (d) *to* (g) *have been renumbered* 5.3.1 (c) *to* (f).

■ *Section 7*
Referenced standards

7.1 Noise

(*Part only shown*)

7.1.1 The following National and International Standards for noise are referred to in these Rules:

- ~~IMO Resolution A.468(XII), *Code on noise levels on board ships*.~~
- IMO Resolution MSC.337(91), *Adoption of the code of noise levels on board ships*.

7.2 Vibration

7.2.1 The following National and International Standards for vibration are referred to in these Rules:

- ~~ISO 6954:1984, *Mechanical vibration and shock – Guidelines for the overall evaluation of vibration in merchant ships*.~~

Part 7, Chapter ~~14~~ 13
On-shore Power Supplies

Effective Date 1 July 2014

Existing Chapter 14 *has been renumbered Chapter* 13.
Please see Cross-references back pages for further changes.

■ *Section 2*
Essential features

2.1 General requirements

2.1.6 Consideration may be given to arrangements that are considered by LR to provide an equivalent level of safety. Evidence demonstrating compliance with ~~IEC PAS 60092-510, *Electrical installations in ships – Special features: High-voltage shore connection systems*~~ IEC/ISO/IEEE 80005-1: *Electrical installations in ships – Special features: High-voltage shore connection systems*, or ~~other~~ a relevant National Standard~~s~~, may be submitted for consideration of acceptability by LR.

■ *Section 3*
Electrical connection

3.3 Connection cables, plugs and socket-outlets

3.3.1 Plugs and socket-outlets for external electrical power supply connection points, including those for external control engineering arrangements, are to be designed ~~to avoid the possibility of incorrect connections being made~~, constructed and tested in accordance with IEC 62613-1: *Plugs, socket-outlets and ship couplers for high-voltage shore connection systems (HVSC Systems) – Part 1: General requirements* or a relevant National Standard.

3.3.2 Plugs are to conform to applicable requirements that ensure compatibility with the intended socket-outlet type. Compatible plugs and socket-outlets are to be in accordance with IEC 62613-2: *Plugs, socket-outlets and ship couplers for high-voltage shore connection systems (HVSC-Systems) – Part 2: Dimensional compatibility and interchangeability requirements for accessories to be used by various types of ships* or a relevant National Standard.

~~*3.3.3* Plugs and socket-outlets are to have provisions for connection to be made such that no strain is transmitted to the terminals and contacts. They are to be so designed such that when in place they will be held in positive contact.~~

~~*3.3.4* Plugs and socket-outlets are to be provided with means of locking together in the connected position.~~

~~*3.3.5* Plugs and socket-outlets are to be designed and constructed with the following sequence of connection and disconnection:~~

~~Connection~~
- ~~earth contacts; then~~
- ~~power contacts; then~~
- ~~pilot contacts.~~

~~Disconnection~~
- ~~pilot contacts; then~~
- ~~power contacts; then~~
- ~~earth contacts.~~

~~Pilot contacts refers to any auxiliary contacts used as part of the plug withdrawal detection required by 5.3.5.~~

~~*3.3.6*~~ *3.3.3* Type tests are to be carried out on power connection plug and socket-outlets and cables, in accordance with ~~appropriate~~ IEC 62613-1: *Plugs, socket-outlets and ship couplers for high-voltage shore connection systems (HVSC Systems) – Part 1: General requirements* and Annex A.3 of the IEC/ISO/IEEE 80005-1:2012: *Electrical installations in ships – Special features: High-voltage shore connection systems* respectively or a relevant National ~~s~~Standard~~s~~, to verify design suitability for the intended application described in the Design Statement. Type test reports are to be submitted that include details of the standards, the tests conducted and their order and the acceptance criteria. ~~Tests to be included are shown in Table 14.3.1 and 14.3.2.~~ Alternative proposals may be submitted for consideration.

~~Table 14.3.1~~ ~~Type tests for external power supply~~ connection plugs and socket-outlets

Electrical tests
Partial discharge for high voltage ratings
High voltage
Short time and peak withstand current
Lightning impulse withstand
Withdrawal test to ensure a short-circuit arc cannot initiate in any position between complete insertion of the plug and the position at which withdrawal is detected, *see also* 5.3.5
Temperature rise
Mechanical tests
Shock and vibration
Enclosure degree of protection
Ageing of gaskets and insulators
Corrosion and resistance to rusting
Environmental tests in accordance with IEC 60092-101, Annex B and IEC 60721-3-6 for the ship environment following IEC TR 60721-4-6 for climatic and biological conditions and exposure to chemically and mechanically active substances and mechanical conditions
Normal operation test (at least 5000 cycles)
NOTE After conducting the tests above, the temperature rise test, lightning impulse withstand test and high voltage test should be repeated.

~~Table 14.3.2~~ ~~Type tests for external power supply~~ connection cables

Tests in accordance with Pt 6, Ch 2,11.2.2, as applicable
Partial discharge for high voltage ratings following bending tests
Resistance between protective conductors and semi-conductive layers where applicable
Solar radiation resistance
Abrasion resistance
Low temperature

~~*3.3.7* High voltage cables, plugs and socket-outlets that also contain integral low voltage conductors (for example as part of the plug withdrawal detection required by 5.3.5) are to be of a construction and installed such that low voltage conductors are not subjected to high voltage, by physical connection or induction, under normal circumstances or in the event of a failure.~~

~~*3.3.8*~~ *3.3.4* Power connection plugs and socket-outlets are to be assigned with ~~the~~ ratings ~~for the characteristics shown in Table 14.3.3~~ based on testing~~, and~~ in accordance with IEC 62613-1: *Plugs, socket-outlets and ship couplers for high-voltage shore connection systems (HVSC Systems) – Part 1: General requirements* or a relevant National Standard. ~~d~~Details are to be provided in the submission required by 1.4.5. ~~Plug and socket outlets and cable ratings are to address the construction and cover the connections and cores as applicable, including control and auxiliary connections, and are to address the construction and material of the constituent components.~~

~~Table 14.3.3~~ ~~External power supply connection~~ plugs and socket-outlets ratings

Electrical characteristics
Nominal voltage
a.c. withstand voltage
Impulse a.c. withstand voltage
Partial discharge (for high-voltage equipment)
Nominal current
Short time short-circuit withstand capacity
Mechanical characteristics
Non-fixed plug or socket-outlet weight limit
Enclosure degree of protection
Acceptable cable cross-sectional area
Construction materials
Ambient temperature
Shock and vibration
Environmental category in accordance with IEC 60092-101, Annex B and IEC 60721-3-6

~~*3.3.9*~~ *3.3.5* Power connection plugs and socket-outlets are to be ~~constructed and~~ located to minimise the potential of arc flash hazards and suitable warning notices are to be provided at locations along Connection Equipment routes, including power connection plugs and socket-outlets operational locations.

~~*3.3.10*~~ *3.3.6* Connection Equipment power cables are to be Type Approved in accordance with LR's *Type Approval System Test Specification Number 3* or, alternatively, surveyed by the Surveyors during manufacture and testing to assess compliance with ~~3.3.6~~ 3.3.3 and application of an acceptable quality management system. Connection equipment cables are to be installed so as to minimise the risk of short-circuit when correctly applied.

Existing Chapters 15 *and* 16 *have been renumbered* 14 *and* 15*.*

Section numbering in brackets reflects any Section renumbering necessitated by any of the Notices that update the current version of the Rules for Ships.

Part 1, Chapter 2

2.3.21	Reference to Part 7, Chapter 13 *now reads* Part 7, Chapter 12
2.6.2	Reference to Part 7, Chapter 16 *now reads* Part 7, Chapter 15

Part 1, Chapter 3

2.2.26	Reference to Part 7, Chapter 14 *now reads* Part 7, Chapter 13
14.2.12	Reference to Part 7, Chapter 14 *now reads* Part 7, Chapter 13

Part 5, Chapter 2

4.2.2(a)	Reference to Part 6, Chapter 1,2.5.8 *now reads* Part 6, Chapter 1,2.5.7
4.2.2(c)	Reference to Part 6, Chapter 1,2.3.14 *now reads* Part 6, Chapter 1,2.3.13
4.2.2(c)	Reference to Part 6, Chapter 1,2.4.6 *now reads* Part 6, Chapter 1,2.4.5
4.2.2(c)	Reference to Part 6, Chapter 1,2.5.4 *now reads* Part 6, Chapter 1,2.5.3
10.8.8	Reference to Part 6, Chapter 1,2.4.6 *now reads* Part 6, Chapter 1,2.4.5
16.2.2	Reference to Part 7, Chapter 16 *now reads* Part 7, Chapter 15

Part 5, Chapter 7

Table 7.5.1	Reference to Part 6, Chapter 1,2.5.3 *now reads* Part 6, Chapter 1,2.5.2

Part 5, Chapter 9

8.2.7	Reference to Part 6, Chapter 1,2.6.9 *now reads* Part 6, Chapter 1,2.6.8

Part 5, Chapter 10

Table 10.18.1	Reference to Part 6, Chapter 1,2.5.8 *now reads* Part 6, Chapter 1,2.5.7
18.3.3	Reference to Part 6, Chapter 1,2.4.9 *now reads* Part 6, Chapter 1,2.4.8

Part 5, Chapter 12

2.9.5 now *2.9.6*	Reference to paragraph 2.9.6 *now reads* 2.9.7

Part 5, Chapter 14

10.3.1	Reference to Part 6, Chapter 1,2.5.8 *now reads* Part 6, Chapter 1,2.5.7
12.4.1 now *12.3.1*	Reference to paragraph 12.4.2 *now reads* 12.3.2
12.4.1 now *12.3.1*	Reference to paragraph 12.4.3 *now reads* 12.3.3
12.4.1 now *12.3.1*	Reference to Table 14.12.3 *now reads* Table 14.12.2
12.5.1 now *12.4.1*	Reference to paragraphs 12.5.2 to 12.5.6 *now reads* 12.4.2 to 12.4.6
12.5.1 now *12.4.1*	Reference to Table 14.12.4 *now reads* Table 14.12.3
Table 14.12.1	Reference to Part 6, Chapter 1,2.5.8 *now reads* Part 6, Chapter 1,2.5.7

Part 5, Chapter 15

4.4.3	Reference to paragraph 7.7.5 *now reads* 7.8.7
7.1.1	Reference to sub-Section7.9 *now reads* 7.10
7.1.7	Reference to paragraphs 7.7.7(a) to (d) *now reads* 7.8.9(a) to (d)
7.5.3	Reference to paragraph 7.7.9 *now reads* 7.8.11
7.5.3	Reference to paragraph 7.7.10 *now reads* 7.8.12
7.7.3 now *7.8.5*	Reference to paragraph 7.7.2 *now reads* 7.8.4
7.7.4 now *7.8.6*	Reference to paragraph 7.7.2 *now reads* 7.8.4
7.7.4(a) now *7.8.6(a)*	Reference to paragraph 7.7.2(a) *now reads* 7.8.4(a)
7.7.4(b) now *7.8.6(b)*	Reference to paragraph 7.7.2(b) *now reads* 7.8.4(b)
7.7.6 now *7.8.8*	Reference to paragraph 7.7.2 *now reads* 7.8.4
7.7.6 now *7.8.8*	Reference to paragraph 7.7.4 *now reads* 7.8.6
7.7.6 now *7.8.8*	Reference to paragraph 7.7.5 *now reads* 7.8.7

Cross-references

7.7.7(c) now *7.8.9(c)*	Reference to paragraph 7.7.1 *now reads* 7.8.3
7.7.7(e) now *7.8.9(e)*	Reference to paragraph 7.7.2(b) *now reads* 7.8.4(b)
7.7.7(f) now *7.8.9(f)*	Reference to paragraph 7.7.2 *now reads* 7.8.4
7.7.7(h) now *7.8.9(h)*	Reference to paragraph 7.7.2(a) *now reads* 7.8.4(a)
7.7.7(j) now *7.8.9(j)*	Reference to paragraph 7.7.2(a) *now reads* 7.8.4(a)
7.7.9 now *7.8.11*	Reference to paragraph 7.7.7 *now reads* 7.8.9
7.7.10 now *7.8.12*	Reference to paragraph 7.7.7(d) *now reads* 7.8.9(d)
7.7.11 now *7.8.13*	Reference to paragraph 7.7.7(e) *now reads* 7.8.9(e)
7.7.12 now *7.8.14*	Reference to paragraph 7.7.7 *now reads* 7.8.9
7.7.13 now *7.8.15*	Reference to paragraph 7.7.7(g) *now reads* 7.8.9(g)
7.7.14 now *7.8.16*	Reference to paragraph 7.7.7(h) *now reads* 7.8.9(h)
7.9.6 now *7.10.7*	Reference to paragraph 7.9.16(a) *now reads* 7.10.17(a)
7.9.9 now *7.10.10*	Reference to paragraph 7.9.5 *now reads* 7.10.6
7.9.15 now *7.10.16*	Reference to paragraph 7.9.14 *now reads* 7.10.15
7.9.16(a) now *7.10.17(a)*	Reference to paragraph 7.9.13(a) *now reads* 7.10.14(a)
7.9.16(b) now *7.10.17(b)*	Reference to paragraph 7.9.13(a) *now reads* 7.10.14(a)
7.9.16(c) now *7.10.17(c)*	Reference to paragraph 7.9.8 *now reads* 7.10.9
7.9.16(e) now *7.10.17(e)*	Reference to paragraph 7.9.6 *now reads* 7.10.7
7.9.16(f) now *7.10.17(f)*	Reference to paragraph 7.9.14 *now reads* 7.10.15
7.9.17 now *7.10.18*	Reference to paragraphs 7.9.16(a) to (e) *now reads* 7.10.17(a) to (e)
7.9.18 now *7.10.19*	Reference to paragraphs 7.9.16(a) to (f) *now reads* 7.10.17(a) to (f)
7.10.2 now *7.11.2*	Reference to sub-Section 7.9 *now reads* 7.10
7.10.2 now *7.11.2*	Reference to paragraph 7.9.1 *now reads* 7.10.1
7.10.2 now *7.11.2*	Reference to paragraph 7.9.2 *now reads* 7.10.3
7.10.2 now *7.11.2*	Reference to paragraph 7.9.3 *now reads* 7.10.4
7.10.2 now *7.11.2*	Reference to paragraph 7.9.7 *now reads* 7.10.8
7.10.3 now *7.11.3*	Reference to paragraph 7.9.12 *now reads* 7.10.13

Part 5, Chapter 23

2.1.2 (f)(i)	Reference to Part 6, Chapter 1,2.6.4 *now reads* Part 6, Chapter 1,2.6.3

Part 6, Chapter 1

1.1.9 now *1.1.4*	Reference to Part 7, Chapter 16 *now reads* Part 7, Chapter 15
1.2.2	Reference to paragraph 2.4.9 *now reads* 2.4.8
1.2.2	Reference to paragraph 2.6.9 *now reads* 2.6.8
1.3.3	Reference to Table 14.12.4 in Part 5, Chapter 14 *now reads* Table 14.12.3 in Part 5, Chapter 14
2.4.3 now *2.4.2*	Reference to paragraph 2.4.2(c) *now reads* 2.4.1(c)
2.4.4 now *2.4.3*	Reference to paragraph 2.4.2(a) *now reads* 2.4.1(a)
2.4.4 now *2.4.3*	Reference to paragraph 2.4.2(b) *now reads* 2.4.1(b)
2.4.13 now *2.4.12*	Reference to paragraph 2.4.2(b) *now reads* 2.4.1(b)
2.10.8	Reference to paragraph 1.2.5 *now reads* 1.2.6
2.10.10	Reference to paragraph 1.2.5 *now reads* 1.2.6
2.11.7	Reference to paragraph 2.5.4 *now reads* 2.5.3
2.14.3	Reference to paragraph 1.2.5 *now reads* 1.2.6
2.14.5	Reference to paragraph 2.4.6 *now reads* 2.4.5
2.14.5	Reference to paragraph 2.5.4 *now reads* 2.5.3
7.1.3	Reference to paragraph 1.2.5 *now reads* 1.2.6

Part 6, Chapter 2

1.1.7	Reference to Part 7, Chapter 16 *now reads* Part 7, Chapter 15
4.1.5	Reference to Part 7, Chapter 14 *now reads* Part 7, Chapter 13
16.2.2	Reference to Part 7, Chapter 15 *now reads* Part 7, Chapter 14

Part 6, Chapter 3

1.1.4	Reference to Part 7, Chapter 16 *now reads* Part 7, Chapter 15

Part 7, Chapter 9

1.2.1	Reference to Part 6, Chapter 1,1.2.5 *now reads* Part 6, Chapter 1,1.2.6
4.3.1	Reference to Part 6, Chapter 1,2.6.8 *now reads* Part 6, Chapter 1,2.6.7

Part 7, Chapter 11

1.4.1(a) now *1.5.1(a)*	Reference to paragraph 1.4.3 *now reads* 1.5.3
1.4.1(c) now *1.5.1(c)*	Reference to paragraph 1.4.5 *now reads* 1.5.5
1.4.2 now *1.5.2*	Reference to paragraphs 1.4.3 to 1.4.5 *now reads* 1.5.3 to 1.5.5
1.4.2 now *1.5.2*	Reference to paragraph 1.4.3 *now reads* 1.5.3
1.4.2 now *1.5.2*	Reference to paragraph 1.4.5 *now reads* 1.5.5
1.4.2 now *1.5.2*	Reference to paragraph 1.4.4 *now reads* 1.5.4

Updates to the current version of the Rules for Inland Waterways Ships:

Part 5, Chapter 2

11.5.1(a) now *4.2.2(a)*	Reference to the Rules for Ships Part 6, Chapter 1,*2.5.8 now reads* Part 6, Chapter 1,2.5.7
11.5.1(c) now *4.2.2(c)*	Reference to the Rules for Ships Part 6, Chapter 1,*2.4.6 now reads* Part 6, Chapter 1,2.4.5
11.5.1(c) now *4.2.2(c)*	Reference to the Rules for Ships Part 6, Chapter 1,*2.4.5 now reads* Part 6, Chapter 1,2.4.4

Update to the current version of the Rules for Naval Ships:

Volume 2, Part 2, Chapter 1

7.2.2	Reference to the Rules for Ships Part 7, Chapter 15 *now reads* Part 7, Chapter 14

Update to the current version of the Provisional Rules for the Winterisation of Ships:

1.1.9	Reference to the Rules for Ships Part 7, Chapter 15 *now reads* Part 7, Chapter 14

Update to the current version of the Provisional Rules for LNG Ships and Barges Equipped with Regasification Systems:

4.2.2	Reference to the Rules for Ships Part 7, Chapter 15 *now reads* Part 7, Chapter 14

Update to the current version of the Rules for Natural Gas Fuelled Ships:

Table 1.8.2	Reference to the Rules for Ships Part 6, Chapter 1,2.3.2 *now reads* Part 6, Chapter 1,2.3.1

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